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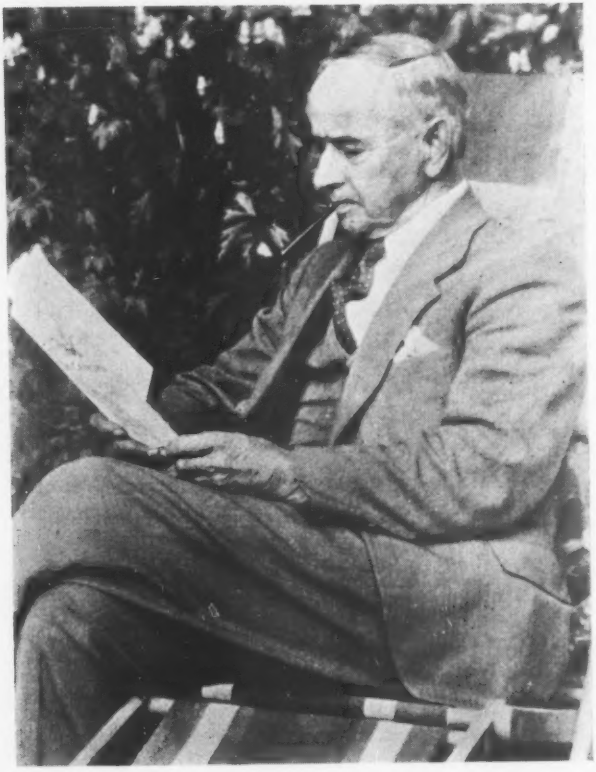

Ralph Hopping (1868-1941)

Ralph Hopping (1868-1941)

Ralph Hopping died at his home in Vernon on the morning of October 29, 1941. By profession an economic forest entomologist, his hobby was systematics, and he was well known to students of the Coleoptera of North America. He had been a member of our Society for the past twenty years, and was President in 1936. He was born on April 8, 1868, in New York city. His father was George W. Hopping, expert accountant, treasurer of the firm of Seabury and Johnson (now Johnson & Johnson, makers of first-aid and medical supplies), and a veteran of the Civil War. His mother was Laura De Grasse.

Mr. Hopping was educated in New York; he completed his first two years at Rutgers College, then left because of ill health, and moved to California. He and his brother Burt arrived there on April 8, 1891, and joined the Kaweah Co-operative Colony in Tulare County. In April, 1892, he married Katherine Blanche Redstone, and they made their home in Kaweah. The colony disintegrated before long; Ralph Hopping then raised cattle, horses and mules, and in 1895 worked in a lumber mill. In 1898 or 1899 he entered into a partnership with John Broder, and they provided the first tourist accommodations within Sequoia National Park. From May 15 to October 1, 1900, they ran a tri-weekly stage line from Visalia to Kaweah post office, two miles beyond Three Rivers, and from there they used pack mules to carry tourists through the Park. "Camp Sierra" became a base for the packing operations in May, 1901, and from this main camp in Giant Forest, many guests took advantage of the pack-horse trips into the wild and beautiful country of the Kings and Kern River Canyons, and around Mt. Whitney. In this way, Ralph Hopping associated with many notable people, and formed a number of life-long friendships.

When Broder died the tourist camp failed, owing to the legal type of partnership under which it had been formed. Mr. Hopping then entered the United States Forest Service where, because of his knowledge of insects, he was soon made a Forest Examiner. He was placed in charge of insect control in District 5 (California) about 1912, and during the World War his territory included Arizona, New Mexico and Colorado. In 1918 the Dominion Entomological Branch and the British Columbia Provincial Forest Service decided to station a competent forest entomologist in British Columbia, largely because of an extensive outbreak of bark beetles (*Dendroctonus brevicomis* Lec., and *D. monticolae* Hopk.) in the yellow pine stands near Merritt. Dr. J. M. Swaine, then Chief of the Division of Forest Insects, Dominion Department of Agriculture, had been in correspondence with Ralph Hopping for some years, and knew that in matters relating to the control of injurious forest insects, he had more experience than anyone else in western North America. Accordingly in December of that year he asked if he would consider a position in British Columbia, stressing, amongst other things, the opportunity of publishing original observations. This latter point was certainly a major factor in Mr. Hopping's decision to accept the position. He arrived in British Columbia on December 12, 1919, and began his duties immediately as Forest Entomologist, with an office in the Court House in

Vernon. He remained in charge of forest entomology in British Columbia and western Alberta until his retirement on April 8, 1939, at which time he held the rank of Senior Assistant Agricultural Scientist.

From early boyhood he had the keenest interest in natural history, and began to collect beetles at the age of nine. This first collecting was done in and around Bloomfield, N. J., especially along the old Morris and Essex Canal. In the course of his duties, he travelled over most of the settled portions of British Columbia, and made friends wherever he went, endearing himself by his understanding kindliness and his unswerving integrity. Ever an upholder of fair play, he championed the "under dog" in an argument, and went out of his way, in official duties as in private life, to help others. A rare woodsman, he loved the outdoors, and in earlier life few could hold his pace on the trail. His thorough knowledge of dendrology, combined with his unusual powers of observation, resulted in many valuable additions to taxonomic botany by other workers. Always on the watch for beetles, he was continually adding to the large collection and library he brought from California. A great deal of his time was spent in identifying species for other students and he kept up an extensive correspondence. The cerambycid or "longhorn" beetles of the tribe *Lepturini* were his favourites, though he published on several other families; nearly all of his thirty-six articles appeared after 1920. A number of species and at least one genus of beetles, have been named in his honour.

In 1929 he suffered the loss of his wife, and there is no doubt that working over his collection of beetles was a great boon to him in the years that followed. On May 12, 1939, he married Mrs. Eltha Edwards, who survives him and lives in Vernon. He is also survived by a son, George R. of Vernon, two daughters, Mrs. Parker Talbot of San Luis Obispo, Calif., and Mrs. H. C. Hughes of Nelson, B. C., two brothers, Roy and Guy in California, and a sister, Mrs. Jessie Scott of Pasadena, Calif.

Hugh B. Leech.

J. K. Jacob (Died November 28, 1941.)

John Kenneth Jacob is dead, this Province is the poorer for his going and the University has lost one of its most promising graduates. From Prince of Wales school he entered the Faculty of Applied Science at the University of British Columbia, graduating in forest engineering in 1933, then switching to Arts he took his B.A. in 1935 and then M.A. with first class honours in Zoology and Botany in 1938—all by the time he was 27 years old.

Under a Carnegie Graduate Scholarship for research, he made a painstaking and thorough study of the insects affecting all stored food products in the port of Vancouver, ranging from corner grocery stores to flour mills and elevators. He was the best-informed man in Canada on the dreaded wood-destroyers, the termites or white ants, having worked out

the complicated life history of local species. His publications range from systematic and distributional, to faunal studies in entomology; Dr. R. E. Hardy of Utah State Agricultural College named a new insect species in his honour. Recognizing his wide experience and extreme precision, the Dominion Government employed him for two seasons especially to collect certain most-wanted and rare specimens for the National Museum at Ottawa. Leland Stanford University of California awarded him a fellowship to work under Dr. Gordon Ferris, the world's recognized authority in micro-entomology, and he was proceeding to California in 1939 when he became ill and had to enter hospital.

Kindly, unobtrusive, modest, Kenneth's hobby was playing classical music on the piano. He was better known in the scientific world than socially and he leaves his parents, Mr. and Mrs. R. S. Jacob of Vancouver, B. C., and a wide range of friends.

GEO. J. SPENCER.

HOST POISONING BY IXODES CALIFORNICUS BANKS. (Acarina, Ixodidae) *

J. D. GREGSON

Livestock Insect Laboratory, Kamloops, B.C.

Ixodes californicus Banks, sometimes referred to as the Coast Tick, is one of the three most important of British Columbia's ticks. It differs from the other two species in that the bite itself is often poisonous, quite apart from its disease transmitting potentialities. Lately, with the influx of new residents and their pets into fast-growing residential areas which are the habitat of *I. californicus*, records of poisoning from its bite have come regularly to Kamloops. Here at the Laboratory, studies of the life-history of this tick have shown that all stages may produce severe toxemia in host animals.

Persons who have been bitten by this tick very frequently experience a marked swelling of the area surrounding the bite. This inflammation may last for several days, and often causes considerable pain and discomfort. Of ninety replies to a tick-questionnaire sent from this laboratory to residents of West Vancouver, B. C., thirty made mention of such a reaction. The writer, while on a collecting trip, also experinced the marked effects of this poison; a tick attached itself to his arm and was there less than an hour before being discovered and removed. There was an almost immediate reaction, the arm swelling from the wrist to the shoulder, the discomfort becoming progressively more intense until it reached a peak forty-eight hours after the tick had been removed. Associated with the arm condition was a dull ache over the affected side of the body accompanied by a general feeling of malaise.

* Contribution No. 2124, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

In attempts to feed adult ticks at the laboratory, it has been found that a similar edema is produced on guinea pigs so that it is impracticable to use these animals as hosts.

Bites by this tick are often characterized by the formation of slow-healing ulcers at the site of the feeding puncture. These abscesses are usually suppurative and may persist as long as eighteen months, being very resistant to medical treatment. Even though it is probable that the detached mouth parts are responsible in the beginning for some of these ulcers, the severity of the following condition is much greater than might be expected merely from the introduction of a foreign body of the size of tick mouth parts, structures less than half a millimeter in length. Obviously the accompanying toxic irritant plays an important part in preventing, or at least delaying, the healing of bites.

It has been demonstrated at this Laboratory on a number of occasions that the two earlier stages of this tick, the seed or larvae and the nymph, are also poisonous to their hosts. As a rule, the larval progeny of a single tick will kill an adult guinea pig within five days of the infestation, while as few as seventy nymphs have killed one, though they succeeded in engorging only partially before the death of the host. Inoculations of the crushed ticks and the blood of the dead animals into fresh pigs have failed to produce any abnormal symptoms. In spite of the marked susceptibility of guinea pigs to the toxin of *I. californicus*, there are at present indications that an immunity is built up in the survivors of the initial infestations.

A SIMPLE METHOD OF ADDING OR CHANGING PRESERVATIVE LIQUIDS IN SEALED VIALS WITHOUT REMOVING THE CORKS*

E. R. Buckell

Field Crop Insect Laboratory, Kamloops, B.C.

Collections of insects or other material kept in preserving liquid in glass vials are a constant source of worry to the curator. This is particularly so when a volatile fluid such as alcohol is used.

The author has a collection of British Columbia dragonflies preserved in 95% grain alcohol and contained in about 2,000 glass vials. Homeopathic vials of several lengths with extra wide (16 mm.) mouths are used so that even the largest species are easily inserted or removed without injury. Short corks of good grade are best, the corks and necks being dipped several times in liquid wax. Other ways of preventing evaporation were tried but all had disadvantages of one sort or another and the waxed-cork method was adopted.

A dragonfly is an elongated insect, and there is not much space left between its head and the base of the cork in the vial. Therefore very little evaporation need take place before the insect's head and thorax becomes exposed to the air, making it desirable to add more alcohol. Examination of

* Contribution No. 2071, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada

the collection each winter always shows many vials needing alcohol. In past years the corks from these vials were replaced by new ones and the tops of the vials again waxed; old corks, soaked with alcohol and greasy with wax, refuse to stay in place. This annual replacement of corks is tedious and expensive.

The use of a hypodermic syringe was found to completely overcome all the difficulties previously experienced; alcohol may be added without the removal of a single cork or the breaking of the coating of wax or other material used to prevent evaporation. A cheap hypodermic syringe of the type having a conical glass point fitting without screw or locking device into the funnel-shaped cavity in the heavy base block of the needle, has proved to be best. Needles of No. 20 gauge and one and three-quarter inches in length are ideal.

With this equipment proceed as follows: Place a rack of vials in front of the operator, in a tray. Detach the needle from the syringe and with the thumb on the base block push the needle through the cork. Run the gauge wire, one end of which has been inserted into a cork to facilitate handling, down through the hollow needle to clear any wax or cork which may have entered. Suck up some alcohol from a beaker or similar receptacle with the syringe; place its conical glass tip in the hole in the base block of the needle and press down on the plunger with the thumb. The alcohol will then flow into the vial. The plunger should be lightly coated with vasoline occasionally to keep it airtight. As soon as resistance is felt on the plunger, due to air pressure within the vial, allow it to spring back and the compressed air will escape. The needle should be kept above the level of the liquid in the vial, else the air pressure may force the cork out. A few downward strokes of the plunger will add 5 to 10 cc. to the vial in a matter of seconds. When the correct amount of alcohol is in the vial, lift off the syringe and pull out the needle with your fingers. The elasticity of the cork will fill up the hole made by the needle, and the small hole in the wax covering the cork can be sealed by the use of a scalpel blade or similar object, warmed in a spirit flame if desired.

If it is necessary to extract fluid from a vial, the procedure is much the same except that the needle should only just clear the cork, the vial should be inverted, and the empty syringe attached *loosely* to the needle. Then by pulling down the plunger the fluid will begin to be sucked out. As soon as *any appreciable resistance* is felt, care must be taken to stop and loosen the syringe in the needle base to allow air to enter the vial through the needle. Then suck out some more fluid. It is much more important to allow air to enter the vial when extracting fluid than to allow it to escape when filling a vial. Too much air pressure when filling will merely pop out the cork, but when extracting fluid a vacuum is created inside the vial, and before the cork will be sucked in the walls of the vial will collapse; this may easily cause a seriously cut hand. A second hollow needle pushed through the cork, to act as an air vent, will overcome this difficulty. When the vial is empty, it can be refilled with fresh fluid as described above. Another use of the hypodermic needle is that it enables a corked vial to be completely filled,

leaving no air space. This cannot be done in the ordinary manner because of air resistance in the neck of the vial.

The method described above, possibly well known to many, has given the author a much kinder feeling towards collections in alcohol. It is hoped that it may prove of value to others, who may include among their duties the care of material preserved in liquids in sealed vials.

THE OCCURRENCE OF THE CLAY-COLOURED WEEVIL, (*Brachyrhinus singularis* (L)) IN BRITISH COLUMBIA (Coleoptera) *

HARRY ANDISON

Dominion Entomological Laboratory, Victoria, B. C.

In April 1937 our attention was called to the severe damage to Portugal laurel growing adjacent to the horticulture building at the Exhibition grounds at Victoria, B. C. On examining the laurel trees, weevils unknown to the writer were found seriously injuring the foliage. Specimens were identified by Mr. W. J. Brown, Division of Entomology, Ottawa, as *Brachyrhinus singularis* (L), known in Britain as the "clay-coloured weevil." To our knowledge this is the first record of this weevil occurring as an economic pest in British Columbia.

The adult is a nocturnal, wingless beetle, oblong-oval in shape, 6 to 8 mm. long, and closely covered with brown and pale yellowish-brown scales, giving it a speckled appearance. Being frequently covered with particles of earth it is very difficult to detect on the soil, especially as it often feigns death when disturbed.

Early History in North America :— In correspondence with Mr. Brown, and from his recent paper in the Canadian Entomologist (2) we learned that the clay-coloured weevil was found in Canada as early as 1902 at Montreal, Que., and has since been collected at Lauzon, Que.; Guelph, Ont.; Yarmouth and Halifax Counties, N. S.; and Charlotte County, N. B. In the United States it occurs at Stoneham and Essex, Mass., the latter place being the first record for North America where it was reported under the name of *Brachyrhinus picipes* Fab. in 1872.

Host Plants and Distribution :— There are few published records of the occurrence of this species of weevil and it seems to be scarce or local in North America. The genus Brachyrhinus is distinctly European in origin and it is possible that in Canada the eastern and Victoria specimens are from separate introductions.

During the past four seasons this pest has been observed causing damage to a wide variety of plants, namely, roses, holly, campanula, iris, shasta daisy, viola, hyacinths and blackberry. In Europe, it is also considered to be an important pest of trees and small fruits. In England, Massee (4) and

* Contribution No. 2126, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

Theobald (5) report that considerable damage has been done to raspberry, apple, strawberry and, to a lesser extent, black currant, loganberry, grape, plum and hops. According to Theobald (5) it often occurs in destructive hordes in Kent, Worcestershire, Gloucestershire and most other fruit growing districts in England. In Germany, Kaven (3) reports it as a pest of rhododendron.

Injury :— The damage done by the weevils is varied. The larvae are very destructive to the roots of the plants. The adults feed on the leaves producing a characteristic "ragging" effect in much the same manner as do *Brachyrhinus ovatus* (L) and *B. sulcatus* Fab. The feeding of *B. singularis* however, is much more extensive and at times the foliage is completely stripped. Injury of this kind is not confined to the new succulent leaves; old leaves and the old leaf stems are sometimes eaten.

In England the adult causes damage by attacking the scions of newly grafted apple trees and damaging apple stocks in the nursery beds. It is very partial to young grafts, which it frequently kills by destroying the buds, leaving the graft "blind." It also gnaws the bark of young apple growth, completely girdling the stems in a very characteristic manner—a type of destruction which we have observed on roses at Victoria. It is an important raspberry insect in England (4) where, if it is left undisturbed in the same fields for many years, it causes a large amount of damage. Most of the injury to raspberry and other cane fruits is done in the spring when the weevil attacks the blossoms and the undeveloped fruit buds. Large areas of fruiting canes are destroyed in this way.

Life History and Habits :— Althougs not studied in detail the life history of the clay-coloured weevil at Victoria appears to be very similar to that of the strawberry root weevil *B. ovatus*, though emergence is somewhat earlier. The adults come from the soil during the latter part of March and start to feed at once.

Eggs are laid in the soil during the late spring and summer months; on hatching, the legless larvae feed upon the roots of the various plants. The grubs are dull white to creamy-yellow in colour, curved, with a much wrinkled skin which is slightly hairy. They pass the winter in a half to full-grown condition and form the pupal cell in March. Variations in the seasonal history occur, as in the case of *B. ovatus* and *B. sulcatus*. Some adults of *B. singularis* that emerge in the spring do not complete ovipositing by September, but overwinter as adults; they become active the following spring, and continue to lay eggs during the summer.

Light soils are especially favorable to the development of the weevil, but according to the literature studied it has frequently been known to attack plants grown on clay land. One important thing has been noticed, namely, that if it occurs in numbers one year it is sure to be many times more numerous next year and unless steps are taken to control an infestation serious losses will result. This point was clearly demonstrated by periodically examining infested holly trees in an old neglected orchard on Vancouver Island. Within three years the population of weevils became extremely high. By giving the trees a sudden jar the weevils could be dislodged from their daytime hiding places among the holly shoots, and as many as 616 were

collected an a canvas sheet spread on the ground beneath a holly tree 10 feet high. Some idea of the larval population was gained by digging in that area during February of this year (1941) when 50 to 60 larvae per cubic foot of soil were found in some parts of the orchard. The rapid increase or high population potential is largely explained by the fact that the weevils are parthenogenetic.

Control :— Where grafts are subject to attack on standard trees the control of this flightless weevil is simple; it is sufficient to grease-band the tree trunks. On bush trees and apple stocks the pest can be completely controlled by painting the grafts with arsenate of lead paste, applied with a brush. The paint must be applied soon after the grafts are tied, because the weevils feed quickly, and comparatively few will destroy numbers of grafts in a short time.

When the weevils persist in plantations of raspberries, strawberries, holly, etc., it is advisable to cultivate the ground thoroughly in March to disturb the pupae and newly formed weevils, and to spray the foliage with lead arsenate.

Experiments conducted at the Victoria laboratory during 1938 showed that an apple pomace bait containing 5 per cent sodium fluosilicate was highly successful as a control against the adults.

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TWO UNUSUAL LARVAL HABITATS OF TABANIDS (Diptera)

G. J. Spencer

Department of Zoology, University of British Columbia, Vancouver, B.C.

All the records I can find of larval habitats of tabanids (Horse flies) state that the larvae are aquatic or semi-aquatic. A. E. Cameron, in his "Bionomics of the Tabanidae (Diptera) of the Canadian Prairie" states, on page 14, "Lutz (1922) who has made extensive studies of the *Tabanidae* of Brazil, argues that because he has not observed oviposition on plants, the eggs may possibly be laid on the ground or in other places where they are not apparent. So far as the *Tabanidae* of the prairie are concerned, this

contingency appeals to us as being somewhat remote, especially as the larvae are always found in close association with an aquatic habit and never in dry soil distant from water. In those species in which the egg-laying habits are known, the eggs are invariably laid so that the larvae on hatching immediately fall into the water, in which they may either remain or sink into the mud below. Oviposition in the soil, on the other hand, seems so contrary to the prevailing, almost semi-aquatic habits, that the co-existence of two such divergent modes of behaviour within the limits of a family, the habits of which are so uniform in other respects, is improbable. Further, the soil would appear to offer to the newly-hatched larvae a medium less suited to its delicate structure than mud and water."

In view of the above, it was of considerable interest to me to find the newly-formed, soft, white puparium of a tabanid under a small stone on the ranges north of Kamloops, B. C. This was found on June 1, 1937, at an altitude of 3,250 feet on a hillside above Lac du Bois, some 150 feet above and 200 yards from, the surface of the lake. The range was heavily overgrazed and dry as only the Kamloops ranges can become dry. True, the soil immediately under the small stone was damp or perhaps better described as being less dry than the surrounding soil, but on the arched shoulder of steep hillside the drainage was so complete that in no sense could the soil have been called moist. The puparium was very gently shovelled into a tin collecting box with about three heaping tablespoons of the soil in which it lay, and was set aside for observation in a dark corner of the field laboratory. Exactly one month afterwards, on July 1, there emerged a perfect specimen of *Tabanus punctifer* O. S.

It is extremely unlikely that the larvae developed on the shore of the lake and at maturity, crawled up a dry hillside, rising 150 feet in 200 yards, to pupate under a small stone. Stones on that part of the range were few and far between. On the other hand, if the larvae pupated where it developed, the question arises "Where was the egg laid if not on the soil or on the scanty overgrazed grass stems in the vicinity?" Tabanid larvae are reported as being predaceous and it is doubtful if this one found enough insects or insect larvae straying under its stone to raise it to maturity so it must have wandered about in the very dry soil all around.

On another occasion on these same ranges I captured two adults of *T. punctifer* on a fence, set about 50 yards up a 60° slope above a small range pool. The hillside was rough and gravelly and very dry. The flies were so newly emerged as to be drowsy and I picked them off by hand. At the time of capture I made a note that it seemed very unlikely that the larvae had matured on the edges of the pool and had migrated up such a steep rough hillside to pupate, and that it seemed likely that they had developed at the base of the fence post.

The second unusual habitat record I wish to report on was a grub taken from the shore of Coal Harbour, on the Stanley Park side, at Vancouver, B. C. It was collected by a team of students doing marine quadrat survey work on the sea beach at unusually low tide and was found a couple of inches down in the sand. The animal was given me by John Davidson, Jr., whose students found it and placed it in a jar of sea water. I left it in the jar of

sea water for three days and then introduced enough clean rain-washed sand to leave a small wet bank up the side of the jar. The grub moved exceedingly slowly and very little and finally pupated in the damp sand bank. There was no indication as to the family it belonged to because it was a curved cylinder, equally blunt at both ends and was covered with a dense coat of moss-like debris. Later on I discovered the last larval skin and had to soak it in caustic potash before this debris came away, revealing a typical tabanid larval exuviae. Certainly when alive, the larva looked absolutely unlike that of a typical tabanid; I had no idea what it was. After about a month there emerged a dull brown fly, which has been identified by Dr. C. B. Philip as *"Hybonitra n. sp.?"*

As far as I can determine, this is the first record of a marine tabanid whose larva developed at a point on the sea shore uncovered by sea water except at low tide.

From a table of sea water determination from 12 stations in Coal Harbour and Burrard Inlet, I cite two records taken from the area where this larva was found in Coal Harbour.

Date	*Hour*	*Depth*	*Temp. °C*	*Chlorinity*	*pH*	*Tide*
Aug. 11	7.30 p.m.	Surface	14.75	13.54	8.15	1st ebb
Aug. 7	10.30	Surface		14.28	7.85	Full ebb

Now the highest chlorinity (salinity) of any station in local waters registered 14.47 whereas that of Siwash Rock area, where the Fraser River water comes in, ran down to 2.94; so these readings for Coal Harbour, of 13.54 and 14.28, showed a high degree of saltiness in the area where the larva was taken, proving an adaptation to, or a necessity for, real marine conditions, and precluding the chance occurrence of a solitary individual in this habitat.

Acknowledgments

I am indebted to Mr. John Davidson Jr., for giving me this marine tabanid larva, and to Professor Andrew Hutchinson of this University for the table of water determinations in Coal Harbour.

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Standard textbooks of entomology.

HOST IMMUNITY TO TICKS (Acarina)

J. D. Gregson

Livestock Insect Laboratory, Kamloops, B.C.

Recent papers on acquired immunity to ticks by William Trager (1, 2 and 3), recalled to the writer a similar experiment that he performed at the Dominion Entomological Laboratory at Kamloops during the autumn of 1936. The results were not published at that time, as the experiment was merely preliminary to further work planned. However, in view of the re-

cent publications of Trager's papers embodying as they do, observations of a similar nature, it is thought that a report of the writer's experiment will be of value.

The initial experiment was conducted with the view of substantiating the popular opinion held by ranchers, that local animals develop immunity to ticks, and are less liable to suffer from their attacks than stock brought in from outside areas. It was desired to prove whether this belief had any basis in fact, and to demonstrate whether or not an immunity that would tend to retard or inhibit the feeding of nymphal ticks could be induced experimentally in laboratory animals.

Two young guinea pigs of equal age and weight were selected and each infested with an equal number (approximately 100) of flat nymphs of *Dermacentor andersoni* Stiles, all of similar stock. Of these about 20 fed on each pig, thus showing an even susceptibility for each animal.

Pig A was then given four weekly subcutaneous injections, each being a 2 cc. emulsion of 20 half-engorged nymphal ticks that had been just previously removed from a guinea pig host. No local or general reaction followed the injections.

On the fifth week both pigs were again subjected to equal infestations of nymphal ticks. At the end of the week, after all ticks had dropped, counts were made. The untreated pig yielded 11 engorged nymphs, the inoculated pig only one.

At the end of the experiment, precipitation tests were made with serum from each animal. A 2 cc. saline emulsion of 20 half-engorged nymphs in dilutions as low as 1 to 5, however, failed to give any precipitate.

A more recent experiment, using fitches and *Ixodes texanus* Banks, shows that these animals will also develop a marked immunity to ticks. Two fitches of a litter which had never been infested with ticks, were covered with the larval progeny of four *I. texanus* females. The infestation was made on October 2. The first ticks to fully engorge started dropping on October 5. The peak of dropping was on the 7th and 8th, while the last few came off on the 11th.

The same pair of fitches were re-infested on the 11th with the progeny of two more females of the same stock. The animals were examined daily until October 30. Of the several thousand ticks placed on them during this second infestation, only about a dozen succeeded in dropping. It is apparent from this experiment, that the fitches developed their immunity within approximately ten days after the start of infestation. Trager (1) notes that guinea pigs develop an immunity to *Dermacentor variabilis* Say within two weeks of the initial infestation, and that this immunity will last for at least three months.

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A LIST OF NINETEEN SPECIES OF ASILIDAE COLLECTED AT ROBSON, B. C. (Diptera)

HAROLD R. FOXLEE

Robson, B.C.

The species listed here, were identified for me by Dr. Stanley W. Bromley, and were all collected at Robson, B. C.

Laphria sackeni Wilcox
Laphria janus McAtee
Laphria gilva L.
Laphria vultur O. S.
Laphria crocea McAtee
Laphria sadales Walker
Laphria francisana Bigot
Asilus occidentalis Hine
Asilus auriannulatus Hine
Asilus callidus Williston
Lasiopogon monticola Melander
Stenopogon inquinatus Loew
Cyrtopogon montanus Loew
Cyrtopogon banksi Wilcox & Martin
Bombomina astur O. S.
Bombomina n. sp.
Pogonosoma ridingsi Cresson
Nicocles punctipennis Melander
Andrenosoma fulvicauda Say.

A NOTE ON THE USE OF MECHANICAL BAIT SPREADERS FOR GRASSHOPPER CONTROL IN BRITISH COLUMBIA*

I. J. WARD

Field Crop Insect Laboratory, Kamloops, B.C.

Fig. 2. Improved type of bait spreader made at Kamloops in 1940.—photo by I. Ward.

The rugged nature of British Columbia's rangeland presents many problems in grasshopper control not found in other parts of Canada. The largest areas subject to outbreaks consist of open rangeland, varying in elevation from 1,000 to 4,000 feet, travel over much of which is difficult.

It is interesting to note the changes that have been made in control measures during the past twenty years. At first, wagons were used to transport bait over the rangeland, and a large amount of equipment was needed to cover a relatively small acreage. Several mixing stations were necessary to serve the baiting

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wagons. To-day it has been found that modern trucks with super-low gearing can travel anywhere that wagons were able to go. There is now a tendency to use mixing machines to prepare the poisoned baits at central stations, from which the trucks operate. Marked advances have been made in developing more effective and cheaper poisoned baits. It may be said that the only part of control that has not changed in British Columbia is the method of spreading the poisoned bait. It is still scattered by hand, and in many respects this is at present the most difficult work in the entire control campaign.

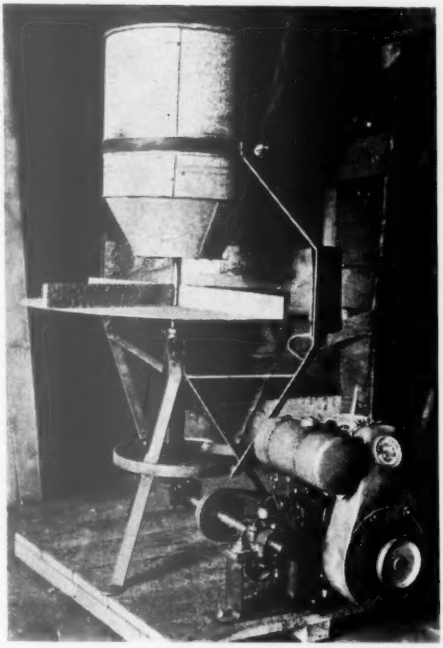

Fig. 1. **Mechanical bait spreader constructed at Kamloops in 1938.—photo by I. Ward.**

No one likes spreading bait by hand, and even when spread by a conscientious worker it is likely that more is used than is actually required. There is a limit to how thinly bait my be scattered by hand, and a careless worker not only wastes a lot but also creates a hazard to livestock. Bait materials are the most expensive items of any control program and this is where a substantial reduction in cost can be made.

The basic ideas for the construction of a bait spreader suitable for use in British Columbia wese obtained from plans of machines that have been used for several years in the Prairie Provinces of Canada, where conditions differ considerably from those in British Columbia. We will describe briefly the machines used on the plains, so that changes required tc meet B. C. conditions may be more readily understood.

Grasshopper Control and Mechanical Bait Spreaders In the Prairie Provinces :— On the prairies poisoned bait is generally mixed in large central stations, but the individual farmer is responsible for carrying out the control on his own property. Some farmers choose to spread the bait by hand, while others construct mechanical spreaders. Most units are made at a low cost by using discarded farm machinery and automobile parts. There are many types, but the operating principle of all is similar, and consists of a plate or spreader table revolving on a vertical shaft. Blades attached to this table catch bait dropped from a hopper above, and throw it by centrifugal force; a guard half way around the table prevents bait from being thrown

back into the vehicle. The action of the bait spreader is very similar to that of some of the small rotary hand seeders used for broadcasting grain. In most cases, power is supplied by (1) a take-off from a pulley or sprocket connected to the back wheel of the baiting vehicle, where the gearing ratio is arranged so that the spreader table revolves at a suitable speed in relation to the speed of the vehicle, or (2) a trailer-type drive in which the rear end assembly of a light car is pulled by the baiting vehicle. The drive shaft in the latter case is placed in a vertical position and the spreader table is connected to it. (For photographs see Farmers' Bulletin 54, Publication 606, Dominion Department of Agriculture). With both types of drive it can readily be seen that the speed of the revolving spreader table is dependent upon the speed at which the baiting vehicle travels. This is entirely satisfactory in the Prairie Provinces, where the land is flat and speed of travel can be fairly constant.

Grasshopper Control and Mechanical Bait Spreaders in B. C. :— In British Columbia, potential grasshopper areas are organized into Grasshopper Control Zones. Control measures are not carried out by the individual farmer. During years of heavy grasshopper infestation, men, trucks, and wagons are hired by an appointed committee to undertake baiting operations throughout the entire Zone area. Equipment and personnel often change from year to year. Under this system it would not be advisable to construct a bait spreader to fit any one vehicle; it should be of a type that could be used on any carrier. Due to the rugged nature of the country, the speed at which baiting vehicles travel is variable, and it would not be practical to use the "trailer-type drive" or "power take-off" as sources of power to operate the spreading unit.

In 1938 an experimental bait spreading unit was constructed at Kamloops (fig. 1). The design was very similar to those in use on the prairies, with the exception that a small air-cooled engine was used to drive the spreader table. Baiting tests were carried out in the Kamloops and Nicola Grasshopper Control Zones under actual range conditions, and the merits and demerits of this machine were observed. Although mechanical limitations made it impractical for general use, valuable information on baiting was gained. The bait was distributed thinly and evenly, and tests proved that at least 50 percent was saved as compared to the baiting-by-hand method. This marked saving warranted further efforts to overcome the mechanical shortcomings. These proved to be that (1) the unit was too high, making it difficult to fill the hopper with bait; (2) the bracing was inadequate for travel over rough terrain; (3) the unit was built without a clutch between the motor and driving mechanism and difficulty was experienced in starting the motor under load; and (4) the revolving speed of the agitator was too high. It can be seen in figure 1 that the shaft operating the spreader table continues into the hopper above and serves as the agitator shaft. It is essential that the spreader table revolve at high speed to break up and throw the wet bait, but it is mechanically unsound to have an agitator revolving at high speed through a wet mash, as the bait is thrown by centrifugal force to the wall of the hopper and does not feed properly through the outlet at the base.

In the spring of 1940 a new unit was built at Kamloops (fig. 2). This

machine was thirty inches in diameter and less than thirty-six inches high, resembling somewhat in dimensions a commercial washing machine. The improved features consisted in that (1) the unit was compact and sturdy enough to travel over rough terrain; (2) the hopper mouth was the full width of the unit, making it easy to fill with bait; (3) the agitator shaft revolved at one-tenth the speed of the spreader table; (4) a clutch was added to the unit to eliminate starting the motor under load; and (5) the unit was constructed so that bait could be thrown in any desired direction. The reduction of agitator speed was accomplished by using a hollow shaft to drive the spreader table; the agitator shaft operated inside of this shaft and was slowed down by means of a worm gear. All gears were enclosed in a gear box filled with oil. The control of direction in bait distribution was by a movable carriage supporting the hopper and guard. This carriage could be revolved quickly to any position making it possible to take advantage of wind direction while baiting. To bait along a roadside the machine could easily be set to throw bait to one side of the vehicle.

Baiting tests showed that the original mechanical shortcomings had been overcome. The improved machine was found to be a satisfactory type for operation under British Columbia range conditions. It was constructed for experimental purposes, however, and cannot be considered as a production model suitable for long periods of service. All gears and bearings were used-car parts. Changes in design were made during the construction of this machine and with the limited funds available it was necessary to overlook refinements of engineering. From plans of this unit two production models are now being built for use in British Columbia Control Zones. The use of proper gears and bearings in place of used car parts makes possible a far more compact gear box, which is cast instead of being made of welded sheet iron. All bracing is rolled angle iron in place of strap iron. The unit will be considerably more compact than the one illustrated in figure 2.

Advantages of Mechanical Bait Spreaders in British Columbia :— Experimental tests have shown that many advantages may be gained by using mechanical bait spreaders in this Province. These are (1) reduced cost of control by saving in bait materials and labor required; (2) more effective control due to a finer, more even distribution of bait; (3) quicker coverage of area of infestation than by baiting by hand; (4) greatly reduced danger of poisoning livestock; (5) more time for the operator of the machine to observe conditions than if busily engaged in throwing bait by hand; (6) possibility of extremely light scattering of bait, allowing areas of light grasshopper infestation to be baited, whereas by the hand spreading method the cost would be prohibitive; (7) allowing lighter equipment to be used to transport bait; and (8) the standardization of control in different Zones in the Province to make possible a more accurate check on results obtained.

Additional Note :— Two production models of the mechanical bait spreader were used in Grasshopper Control Zones in British Columbia during 1941. These units were more compact than illustrated in figure 2, being 30 inches in diameter and 30 inches high.

One slight addition was made to the original design. A circular plate of light metal, corresponding in size to the spreader table, was fastened to

the top of the fins. A hole 12 inches in diameter was cut from the centre of this plate to allow bait to feed to the lower disc of the spreader table. All bait thus travelled through a chute constructed of the two sheets of metal separated by the fins. This afforded a greater spreading range of bait as there was no "floating" of materials, due to wind resistance, encountered when a spreader table with exposed fins was used.

The two machines operated efficiently throughout the baiting season over the most rugged areas encountered in both the Nicola Valley and Clinton Grasshopper Control Zones. A fine, even distribution of bait was obtained and the saving in materials was considerably greater than first estimated from operations with experimental machines.

Acknowledgment

The basic ideas for the construction of a mechanical bait spreader for use in British Columbia were obtained from Publication 606, Farmers' Bulletin 54, published by the Dominion Department of Agriculture. I am indebted to Messrs. H. J. Kemp, S. H. Vigor, and K. M. King, the authors of this publication.

SOME FOOD PLANTS OF LEPIDOPTEROUS LARVAE. List No. 8

J. R. J. Llewellyn Jones

Cobble Hill, B.C.

My thanks are again due to those members of this Society who have furnished information to be included in this List.

The following signs and abbreviations have been used:

G. J. S. Professor G. J. Spencer, Department of Zoology, University of British Columbia, Vancouver, B. C.

G.R.H. Mr. G. R. Hopping, Forest Insect Laboratory, Vernon, B. C.

W.G.M. Mr. W. G. Mathers, Forest Insect Laboratory, Vernon, B. C.

J. McK. Mr. J. McKinnon, Forest Branch, Victoria, B. C.

M.L.P. Dr. M. L. Prebble, Forest Insect Laboratory, Victoria, B. C.

R. G. Mr. R. Glendenning, Dominion Entomological Laboratory, Agassiz, B. C.

J. R. J. Mr. J. R. J. Llewellyn Jones, Cobble Hill, B. C.

An asterisk (*) denotes that the species has been mentioned before in these lists, and that the information now given is either additional or is an amplification of what has been previously reported.

Rhopalocera

**Basilarchia lorquini burrisonii* Mayn.—aspen (*Populus tremuloides* Michx.), black poplar (*Populus trichocarpa* T & G.), wild cherry (*Prunus emarginata* Dougl.), Oregon crab apple (*Pyrus rivularis* Dougl.), Siberian crab apple (ornamental. *Pyrus Siberica)* (J. R. J.)

**Nymphalis antiopa* L. — aspen. (J. R. J.)

**Papilio eurymedon* Luc.— species of apple (garden varieties). (J.R.J.)

Heterocera

**Arctia caja americana* Harr.—aspen, black poplar. (J. R. J.)

Ellopia fiscellaria lugubrosa Hlst.—Western hemlock *(Tsuga heterophylla* (Raf. Sarg.)), Engelmann spruce *(Picea engelmanni* Engelm.), Douglas fir *(Pseudotsuga taxifolia (mucronata* (Raf.) Sudw.)), and many other trees. (G. R. H.)

Epinotia nanana Treit.—*Picea pungens.* (W.G.M.)

**Erannis vancouverensis* Hlst.—Wild Roses *(Rosa gymnocarpa* Nutt. & R. *nutkana* Presl.). (J. R. J.)

Eupithecia palpata Pack. — Engelmann spruce. (G. R. H.)

**Halisidota maculata angulifera* Wlk.—arbutus *(Arbutus menziesii* Pursh.) (J. R. J.)

Mimeola supposita Heinr.—Spp. of Cotoneaster. (R.G.)

Lithocolletis salicifoliella Cham. — mines leaves of species of *Populus.* (W. G. M.)

**Notolophus antiqua badia* Hy. Edw.—blue spruce. *(Picea pungens* (ornamental)) at Vernon, B. C. (G. R. H.)

**Peridroma (Lycophotia) margaritosa saucia* Hbn.—seedlings of cedar, hemlock, balsam, fir *(Abies grandis* Lindl.) in the Quinsam Forest Nursery (M.L.P., J.McK.) Also fireweed (*Epilobium angustifolium* L.) (M. L. P.)

Petrova luculentana Heinr.—scrub pine *(Pinus contorta* Dougl.) (W.G.M.)

Rhyacionia buoliana Schiff.—scrub pine and *P. mughus.* (W. G. M.)

Synanthedon albicornis Hy. Edw.—species of willows *(Salix).* (W. G. M.)

Thiodia marmontana Kft.—balsam root (*Balsamorhiza sagittata* Nutt.). (G. J. S.)

Vespamima sequoiae Hy. Edw. — scrub pine. (W. G. M.)

**Caripeta divisata* Wlk. — Engelmann spruce. (G. R. H.)

INSECTS ACTIVE THROUGHOUT THE WINTER AT VANCOUVER, B. C. PART I: INTRODUCTION AND LISTS OF THE COLEOPTERA AND NEUROPTERA

By R. E. Foster

Department of Biology and Botany, University of B. C., Vancouver

Situated between the 49th and 60th parallels, British Columbia is subject to a moderating influence from the Japanese Current and the moisture-laden westerly winds from the Pacific Ocean. The mild winters so produced on the coast make it possible for a considerable number of insects to remain active during the winter months. At the suggestion of Professor G. J. Spencer of the Department of Zoology of the University of British Columbia,

this survey was started in the fall of 1939, in an effort to determine the extent and character of the insect population of a portion of the University Forest. As identified to date, the preliminary list of insects includes 11 orders and 65 families.

This collecting ground, the University Forest, is today but a remnant of a typical coast lowland stand. The original stand of timber was mainly Douglas fir. Much of this was logged off around 1900. For some years nothing was done to clear windfalls, dead trees or slash from the logging operations. An extensive invasion of deciduous trees followed. Recently silvicultural methods have been accomplished. Traces of all these developments are represented in sections of the survey area. The forest now consists of a mixed stand of Douglas fir *(Pseudotsuga taxifolia,* (Lambert) Britton), Western red cedar *(Thuja plicata* Donn.), Sitka spruce *(Picea sitchensis* (Bong.) Carr.), broad-leaved maple *(Acer macrophyllum* Pursh.) and red alder *(Alnus rubra* Bong.). The sub-flora in a few regions is still quite dense. Sword fern (*Polystichum munitum,* (Kaulf.) (Underw.), salal *(Gaultheria shallon* Pursh.) and oregon grape *(Berberis nervosa* Pursh.) are dominant in the sheltered areas, while the ground covering in the open sections consists of salmonberry *(Rubus spectabilis* Pursh.), thimbleberry (*Rubus parviflora* Nutt.) and blackberry (*Rubus ursinus* Cham. & Schl.). The soil is glacial till with a hard-pan layer close to the surface. This results in a higher water table with pools in the low-lying areas. Aquatic insects are thus provided with excellent breeding grounds.

In Greater Vancouver during the past ten years (1929-39), the average mean minimum temperature was 36 degrees F., the average mean maximum temperature 46 degrees F., the precipitation average 7.7 inches, and the average hours of bright sunshine 71 hours per month for the period from November to March inclusive. These records will give a fair idea of the conditions under which my collecting was done, and are submitted here very briefly, in place of my own detailed records.

The survey was carried out from November, 1939, to March, 1940. Collections were made three times a week for two and one-half hour periods per day, between the hours of 11 a.m. and 3 p.m., the hours of greatest insect activity in this area. In collecting, actively moving insects received the most attention, although during very wet periods most of the specimens were obtained by sweeping fern and salal beds. The forest floor showed a number of active Thysanura and Collembola, but they were not collected. Only in the case of the Pentatomidae and Elateridae are hibernating insects represented. It may be noted that the University campus is the type locality for two species of winter staphylinid beetles, *Trigonodemus fasciatus* Leech and *Coprophilus sexualis* Leech (1939), and presumably for the fly *Cramptonomyia spenceri* Alexander (1931).

Winter insects in British Columbia can be differentiated into two groups, those few peculiar forms that work their way up through snow and suddenly appear on the surface, and those that are active throughout the winter months. Concerning the first group, I do not know of any published records referring to the coast of British Columbia, but Cockle (1, 2) wrote up his observations at Kaslo, on noctuid larvae and the mecopteron *Boreus califor-*

nicus Packard, while Treherne (5) gave Harry Blurton's notes on the wingless tipulid *Chionea valga* Harris, at high elevations near Mara. For the second group, namely those that are active throughout the entire winter, the late J. K. Jacob (3) gave data on the dipteron *Cramptonomyia spenceri* Alexander in the University forest. During the first three months of 1939, Miss A. M. Gwyn of Vancouver did some intermittent collecting in the same area as did Jacob; her findings were presented in a short essay to the Department of Zoology of the University of British Columbia.

LIST OF THE COLEOPTERA

Family CANTHARIDAE

Podabrus piniphilus Esch.

Family CERAMBYCIDAE

Opsimus quadrilineatus Mann.
Plectrura spinicauda Mann.

Family CHRYSOMELIDAE

Altica ambiens Leconte. Feeding on *Alnus rubra.*

Family COCCINELLIDAE

Coccinella californica Mann.
Cycloneda sanguinea L.
Psyllobora 20-maculata taedata Leconte. On *Alnus rubra.* Very common.

Family CURCULIONIDAE

Geoderces melanothrix Kby.

Family DERODONTIDAE

Derodontus trisignatus Mann.
Laricobius n. sp.

Family ELATERIDAE

Ampedus rhodopus Leconte.
Dalopius sp.

Both of these genera were obtained under the bark of Western red cedar *(Thuja plicata).*

Family GYRINIDAE

Gyrinus picipes Aube'. In temporary limnophilous community.

Family HYDROPHILIDAE

Cercyon sp. A.
Cercyon sp. B.
Cercyon sp. C.

All three species in temporary limnophilous communities.

Family LAMPYRIDAE

Lucidota californica Mots. Disturbed from the bark of Western red cedar

Family LEIODIDAE

Anisotoma sp.

Family SILPHIDAE

Agyrtes longulus Leconte.
Necrophilus hydrophiloides Mann.
Necrophorus marginatus Fab.

Family SCARABAEIDAE

Aphodius pardalis Leconte.

Family SCOLYTIDAE

Pseudohylesinus sp.

Family STAPHYLINIDAE

Aleochara sp.
Amphichroum sp.
Anthobium sp. (probably *A. pothos* Mann.).
Boletobius sp.
Coprophilus sexualis Leech.
Falagria sp.
Lathrimaeum sp. (near *fimetarium* Mann.).
Lathrimaeum sp. (near *subcostatus* Makl.).
Micropeplus sp.
Omalium sp.
Oxytelus sp. (near *exiguus* Er.).
Staphylinus lacustris Bernh.
Stenus sp. A.
Stenus sp. B.
Stenus sp. C.
Stictolinus sp.
Tachinus crotchii Horn.
Tanyrhinus singularis Mann.

Family TENEBRIONIDAE

Helops pernitens Leconte.

ORDER NEUROPTERA

Family HEMEROBIIDAE

Hemerobius stigmaterus Fitch.
Hemerobius pacificus Banks.

Family CHRYSOPIDAE

Chrysopa harrisii Fitch. —"This determination made by N. Banks, but note that the specimen lacks the abdomen, so that its determination cannot be made with absolute certainty." (F. M. Carpenter).

Acknowledgments

I am indebted to Professor G. J. Spencer for assigning me this problem, to Dr. W. A. Clemens, Head of the Department of Zoology, and to Dr. A. H. Hutchinson, Head of the Department of Botany, for permission to present a summary of my findings before this Society, to Mr. Hugh B. Leech, Dominion Entomological Laboratory, Vernon, B.C., for the identifications of the Coleoptera, and to Dr. Frank M. Carpenter of the Museum of Comparative Zoology, Cambridge, Mass., for determining the Neuroptera.

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A PRELIMINARY LIST OF THE NEUROPTERA OF BRITISH COLUMBIA

G. J. Spencer

Department of Zoology, University of British Columbia, Vancouver, B.C.

The following list of Neuroptera is based on the University collections which are mostly of my collecting, supplemented in the case of the Hemerobiidae and the Chrysopidae by records from the Canadian National Museum at Ottawa, mentioned respectively by Carpenter (1) and Smith (3). The collections were submitted to Dr. Nathan Banks who had very kindly consented to name them, but unfortunately a number of specimens of some families was not included in the shipment so it is possible that several more species occur in these collections than are represented in this list. Moreover, this list contains only the names of the specimens that were returned to me; some, especially the one specimen of Mantispidae and Berothidae respectively, were retained by Dr. Banks and are now, I presume, in the Museum of Comparative Zoology at Cambridge, together with perhaps others whose names I do not have. This effort is therefore not representative of all the species named or collected up to the present but it is sufficiently encouraging to indicate that the Neuroptera are very well represented in this province and would well repay consideration of some collecting enthusiast.

I am deeply indebted to Dr. Nathan Banks for naming my material and for submitting certain families to Dr. F. M. Carpenter who identified all the Hemerobiidae, the one sisyrid and the one berothid; also to Dr. H. H. Ross for checking my identification of the Harrison Lake *Sialis rotunda*.

Classifications of the order Neuroptera vary among systematists; Brues and Melander raise two families to ordinal status: for the moment it is easier to adopt the arrangement of Essig (2). Some 23 families are found in the world, 13 of these in North America, and of the 13, no less than 10 are so far represented in British Columbia.

Family SIALIDAE. Alder flies, Dobson flies.

Here occur the giants of the order—insects some 2½ inches long, the Dobsons. They seem to be more common at Cowichan Lake than elsewhere; a few occur in the lower Fraser Valley.

Neohermes disjunctus Walker. Vancouver, Mission, Cowichan, Bella Bella.
Chauliodes pectinicornis L. Cloverdale, Cowichan.
Sialis rotunda Banks. Vancouver, Cameron Lake, Courtenay, Harrison.
Sialis fuliginosa Pictet. Wellington. (3)

A considerable flight of *Sialis rotunda* Banks occurred from about

9 A.M. to 1 P.M. on April 22, 1941, from the stream and shallow pond behind Harrison Hot Springs Hotel. Some 40 mallard ducks live in this small area and the nymphs of this insect must have survived the feeding activities of the ducks. Only five per cent of *rotunda* were females, showing that the emergence was just beginning.

Family RHAPHIDIIDAE, Snake flies.

The larvae of these insects are most ferocious creatures; a hungry wolf tearing a carcass to pieces is a peaceful animal by comparison. Their capacity is surprising; a flat larvae will tear out and consume the contents of an almost full-grown cutworm and its abdomen becomes so distended that it seems likely to burst; if presented with another cutworm it will attack and tear it open although unable to hold any more. The insects are widely distributed in the Dry Belt, on the dry hillsides on the north shore of Vancouver and in the eastern strip of Vancouver Island.

Rhaphidia adnixa Hagen. Lytton, Midday Valley, Okanagan, Forbidden Plateau, North Vancouver, Kamloops.

Rhaphidia oblita Hagen. Nicola, Victoria.

Family MANTISPIDAE. Mantispids.

Insects with prehensile fore-legs, held forwards in the manner of the true mantis. One specimen was sent to me alive some years ago from near Long Lake, Vernon. It was a heavily gravid female which was not interested in odd insects I introduced into the cage, or water to drink, and died in a few days. The mantispids are parasitic in spiders' egg masses but my specimen ignored a number of egg sacs that I gave it. It is perhaps parasitic on certain kinds of spiders only. The species is rare in British Columbia; the only other one I have seen is in the Provincial Museum, Victoria. Our species is *Climaciella brunnea* Say *occidentalis* Banks. My specimen was retained by Dr. Banks so I presume it is in the Museum of Comparative Zoology.

In the Bulletin for 1906, No. **4**, p. 4, Harvey records *Mantispa brunnea* Say "from Wellington; rare; August."

Family POLYSTOECHOTIDAE.

Of the 2 species of this North American family, one, *Polystoechotes punctatus* (Fabr.) is distributed right across the continent. It occurs widely in this province and is quite common in late summer. It is a remarkable fact that of its metamorphosis, the egg stage and first instar larvae only are known. Entomological fame awaits the man who works out its life history. I feel certain that the young stages are aquatic because the adults, which are attracted to light, occur most plentifully not far from bodies of water. When this University was opened in 1925, the area was full of holes where giant stumps had been blasted out and the holes were full of water. That autumn a tremendous flight of these insects occurred; nothing approaching it has happened since. There is such great variation in the size and markings of both sexes of this insect as to make it appear that more than one species is present.

Family HEMEROBIIDAE.

This is a family of uniformly small insects from 8 to 14 mm. in length

for the most part pale brown although some have nearly colourless wings. In shape they are like miniature *Polystoechotes*. Carpenter records 50 species in North America. I have 13 species taken in the general run of collecting, and some have been given me by collectors, especially Mr. H. B. Leech. If any one were to concentrate on the family I am sure that our list of species would be considerably extended.

Dr. Banks submitted my material to Dr. Carpenter who identified all the specimens. Carpenter has examined the Hemerobiidae in the Canadian National Collection and in his recent work (1) records the following 19 species in British Columbia, of which list I have indicated those occurring in the University collections, by their distribution records. Carpenter's distribution records are in brackets.

Hemerobius humulinus Linn.	Vancouver, (Agassiz, Vancouver).
Hemerobius stigmaterus Fitch	Vancouver, Agassiz, Salmon Arm, Fernie. (B. C.).
Hemerobius pacificus Banks	Tofino, Nanaimo, Vancouver, Eburne, Indian River, Crescent, Langley Prairie, Nicola, Salmon Arm, Okanagan Lake. (B. C.).
Hemerobius ovalis Carpenter	n. sp. (Wide distribution).
Hemerobius kokaneeanus Currie	Vancouver, (Kokanee Mt., Hedley)
Hemerobius nigrans Carpenter	n. sp. Aspen Grove. (Mt. Loho Kamloops, Type locality Clinton; Aspen Grove.).
Hemerobius bistrigatus Currie	Vancouver. (Vancouver).
Hemerobius conjunctus conjunctus Fitch	Fernie. (Clinton, Nelson).
Hemerobius conjunctus pinidumus Fitch	Kamloops. (Kamloops).
Hemerobius dorsatus Banks	Chilcotin. (Chilcotin, Clinton, Jesmond, Rolla).
Hemerobius simulans Walker	(Salmon Arm).
Hemerobius costalis Carpenter	n. sp. (Keremeos).
Kimminsia coloradensis (Banks)	(Clinton, Hedley).
Kimminsia involuta Carpenter.	n. sp. (Hedley, Kaslo).
Wesmaelius longifrons (Walker)	Victoria, Vancouver, Fernie. (Victoria, Hedley).
Sympherobius angustus Banks	Chilcotin. (100 Mile House).
Micromus angulatus (Stephens)	Vancouvre. (Vernon, Agassiz, Vancouver).
Micromus montanus Hagen	Barkerville. (Hope to Kaslo).
Micromus variolosus Hagen	(Hedley, Lillooet).

Mr. Ray Foster, 4th year student at this institution, has kindly permitted me to record here that he has taken the two species, *H. stigmaterus* and *H. pacificus*, fairly extensively during winter months from November to March, sometimes as many as 30 specimens at a time on one cedar tree.

Family SISYRIDAE. Spongilla flies.

The larvae of these insects feed upon *Spongilla*, the fresh water sponges. These sponges are not uncommon in rapid streams in this province and it

is likely that the flies are widely distributed. Several species of sponges, belonging to several genera, are common in B. C. but their identity has not been established. I do not know if the flies attack the genus *Spongilla* only.

Sisyra vicaria Walker. Agassiz. Det. by F. M. Carpenter.

Family BEROTHIDAE.

Small insects about the same size as the Hemerobiidae which "have two striking characteristics" (Carpenter): (1) in most species the outer margin of the fore wing is more or less incised below the apex (2) scales are present on the wings and thorax of the female of certain species. Carpenter lists only 10 species in North America. Our only record is a male *Lomomyia occidentalis* (Banks) which I collected at McGillivray's, between Lytton and Lillooet, August 2, 1931. The specimen was not returned to me by Dr. Banks so I presume it is in the Museum of Comparative Zoology. This insect seems widely distributed but very rare; of it, Carpenter says . . . "two cotypes were mentioned by Banks, one (female) from Ormsby Co., Nevada (C. F. Baker) and the other from Phoenix, Arizona. The former is the only one I have been able to locate; it is in the Museum of Comparative Zoology and is here designated the lectotype. Allotype, by present designation: Clayton, Cal., July 20, 1935 (R. H. Beamer) in the University of Kansas Museum. In addition to the types I have seen only two other specimens: female, San Diego, Cal. Aug. 3, 1913 (E. P. Van Duzee); and male, Lytton, British Columbia, Aug. 2, 1931."

Family CHRYSOPIDAE. Lace Wing flies or Aphis lions.

About 50 species of this family have been found in North America. Smith (4) records 34 species for Canada with two possible others of which 20 species and 10 varieties occur in this province. My collections contain 10 species labelled in Dr. Banks handwriting and it is quite possible that the collections here contain several more species because only one half of the specimens were forwarded to Dr. Banks. One species, *Chrysopa crotchi* Banks, is not included in Smith's list and so it apparently constitutes a new Canadian record.

The following list with place names shows the specimens in the University collections; the place names in brackets show Smith's list; (B. C. only) in brackets indicates that this species has been taken in Canada, only in this province.

Nothochrysa californica Banks. Nanaimo, Vancouver. (Victoria). (B. C. only).

Smith says that the Canadian National Collection contains only one chewed-up specimen of this handsome species which was taken in Victoria. I collected several specimens at Departure Bay, Nanaimo, and Leech took it at Vancouver. It is the darkest-veined, darkest-bodied species and does not at first sight resemble others of the family. The wings are colourless irridescent with an elongated stigma.

Eremochrysa fraterna (Banks)	(Lillooet). B. C. only).
Eremochrysa punctinervis (McLach.)	(Oliver). (B. C. only).
Meleoma emuncta (Fitch)	(Nanaimo, St. Marys, Lillooet).
Meleoma signoretti Fitch	(Oliver. 1 other record from Quebec).

Meleoma verticalis Banks	Cowichan Lake. (There is only one male specimen of this species in the C. N. collection, taken at Algonquin Park, Ontario).
Chrysopa nigricornis Burm.	Vancouver. (Victoria, Vancouver, Okanagan valley).
Chrysopa coloradensis Banks	Winslow, Kamloops. (Widely distributed, in B. C. only).
Chrysopa columbiana Banks	(Oliver). (B. C. only).
Chrysopa excepta Banks	(Nicola, and Oliver B. C., and Lethbridge, Alta., only).
Chrysopa oculata Say var. *oculata* Say	Victoria, Cowichan, Departure Bay, Alert Bay, Vancouver, Vernon, Summerland, Osoyoos. (General).
Chrysopa oculata var. *chlorophana* Burm.	Vancouver, Agassiz, Ladysmith, Winslow, Chilcotin. (Vernon, Oliver).
Chrysopa oculata var. *carei* Smith	(Cranbrook, Creston, Rolla, Pouce Coupe).
Chrysopa oculata var. *xanthocephala* Fitch	(Comox, Salmon Arm, Rolla).
Chrysopa oculata var. *bipunctata* Fitch	(Rolla, Nelson).
Chrysopa oculata var. *illepida* Fitch	(Salon Arm, Vernon).
Chrysopa oculata var. *albicornis* Fitch	(Oliver, Vernon).
Chrysopa oculata var. *separata* Banks	(Agassiz, Salmon Arm, Nelson, Rolla).
Chrysopa pleuralis Banks	(Merritt, Hedley).
Chrysopa chi var. *chi* Fitch	(General).
Chrysopa chi var. *upsilon* Fitch	Kamloops, (Vancouver, Agassiz).
Chrysopa plorabunda Fitch	Departure Bay, Cowichan, Vancouver, Vernon, Osoyoos. (General).
Chrysopa plorabunda var. *californica* Coq.	(Wellington, Oliver, Lillooet).
Chrysopa downesii Smith	(General).
Chrysopa harrisii Fitch	Vancouver. (Victoria, Comox).
Chrysopa harrisii var. *externa* Hagen	(Vancouver, Keremeos, Oliver).
Chrysopa quadripunctata Burm.	(Vancouver Is., B. C. only).
Chrysopa gravida Banks	(Departure Bay, Victoria, Vancouver Is., B. C. only).
Chrysopa majuscula Banks	(Departure Bay. B. C. only).
Chrysopa cockerelli Banks	(Victoria).
Chrysopa crotchi Banks	Departure Bay, Vancouver, Kamloops, Okanagan Lake.

Family MYRMELEONIDAE. Ant lions.

The inverted cone-like pits of the larvae of Myrmeleonids are common in dry sandy areas in the dry Interior and on the dry east coast of Vancouver Island. The damselfly-like adults are nocturnal but I have watched them at Kamloops suddenly become active just about 4 A.M., at sun-up, and feed

from flowers of wild mustard; as soon as the sun was well up, i.e., in about 20 minutes, the insects dropped to the ground again.

In 1907 Dr. Banks listed 11 genera and 58 species of this family in North America: Essig lists 46 western species alone. I have taken only 4 species so far in the course of general collecting in the Province but I suspect that several more will be found.

Myrmeleon immaculatus occidentalis Currie. Bute Inlet, Midday Valley, Nanaimo, Chilcotin.

Hesperoleon brunneus (Currie) (*B. centralis* Banks).
Dr. Banks said that he was very interested to note this species occurring in B. C. as he had described it originally from Arizona. Local records from Lytton, Chilcotin, Midday Valley; Courtenay (J. Gregson).

Hesperoleon ferox Banks — Lytton.
Hesperoleon abdominalis Say — Chilcotin, Lytton.

Family CONIOPTERYGIDAE. Mealy-winged Neuroptera.

These are the smallest neuropterids in the Province, the adults being just under 4m.m. long. The wings and body are covered with a whitish powder like the Aleyrodidae, white flies. The larvae are predaceous upon small insects and red-spider eggs. Banks reports 8 genera for North America, containing 11 species. Our collections contain one species only.

Conwentzia hageni Banks. — Salmon Arm.

Essig reports this insect as being "common throughout California, probably with a wide distribution in the west inasmuch as it is generally found throughout the entire country. It is most common during August, September and November, when the red spider is also most numerous." Hugh Leech collected our specimens in Salmon Arm on 29 April, 1931, from *Thuja plicata.*

In this preliminary and fragmentary list are 54 species and 10 varieties belonging to 10 families. I feel sure that persistent and concentrated collecting will produce many more species.

References

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2. **Essig, E. O.** 1926. Insects of Western North America. Macmillan.

3. **Harvey, R. H.** 1906. Notes on the distribution of insects in British Columbia. Bulletin of British Columbia Ent. Soc. No., 4, December, 1906.

4. **Smith, Roger C.** 1932. The Chrysopidae (Neuroptera) of Canada. Ann. Ent. Soc. America 25 (3): 579-600, 1 colored plate.

THE DATES OF PUBLICATION OF CERTAIN NUMBERS OF THE PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA *

HUGH B. LEECH

Vernon, British Columbia

It seems desirable to establish the dates of publication of the various numbers of the "Proceedings of the Entomological Society of British Columbia." In several cases, the numbers were not published even within the year cited on the covers or title pages. The data given in the following article are taken chiefly from records and letters of transmittal in the possession of the Society.

First of all, just what constitutes actual publication? There is as yet no definite ruling on this matter, by the International Commission of Zoological Nomenclature. A generally accepted suggestion is that to establish the first date of publication, a journal must give out or distribute on the one day, ten or more copies; i.e. a mailing or distributional date, as against a printing date. In the case of our Society's "Proceedings," distribution of copies at an Annual Meeting could thus establish a date of publication. For a period of years, it was customary for the Secretary of the Entomological Society of British Columbia to send copies of our "Proceedings" to the printers of the "Canadian Entomologist." The firm then mailed both journals under one cover. This would undoubtedly establish dates of publication for certain of our numbers, provided copies had not already been distributed in a recognized manner. Unfortunately, I am not sure how long this method was adhered to, nor which annual numbers are involved.

The earliest publication of our Society, then known as the British Columbia Entomological Society, was the quarterly "Bulletin," edited by Captain R. V. Harvey, and financed by the members. Ten numbers were published between March, 1906, and June, 1908. Complete sets of these Bulletins being rare, they were reprinted in August, 1926.

After a few years of quietness, the Society became active again in 1911, largely through the enthusiasm of the new secretary, the late R. C. Treherne. Publication was resumed under the title "Proceedings of the British Columbia Entomological Society." The first two numbers were printed at the private expense of a few members, but the Provincial Department of Agriculture later reimbursed the Society. Manuscripts for the third number dealt chiefly with economic entomology, so Treherne, backed by a favorable resolution from the British Columbia Fruit Growers' Association, put up a strong case to the Department of Agriculture at Victoria. He succeeded in having No. 3 passed through the Government press free of charge to the Society, which latter had by then become known as the Entomological Society of British Columbia. Because many papers were considered to be

* Contribution No. 2122, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Ontario.

too technical for the farmer, it became necessary to submit only the purely economic manuscripts to the Department of Agriculture, while the others were printed through the Department of Education. This led to the labelling of the Proceedings as "Economic Series," and "Systematic Series," the numbers of the former being consecutively paged, those of the latter independently. This system resulted in double numbers, and a considerable mix-up in the order of publication; it was discontinued with No. 20.

Number 1. : "1911" is imprinted on the title page, but on page 39 there is a List of Members dated as for "January 19th, 1913," presumably a misprint, for just below that is the Financial Statement as of "January 31st, 1912." The Fruit Magazine Publishing Co. Ltd., Hastings Street West, Vancouver, sent a printing bill for $94.00, which was paid on February 14, 1912. On March 6, 1914, R. C. Treherne wrote to an Entomolgical Society in Naples, saying in part:: " . . . Bulletin No. 1, which was published in December, 1911 . . . "

Thus December 31, 1911, might be acceptable as the date of publication, though the data are confusing, and suggest January or February, 1912, as possibilities.

Number 2. : This was printed by Western Specialties, Ltd., Vancouver. The title page gives "1912," but this can be ruled out as a date of publication, since Plate 1 is a photograph of members taken at the afternoon session of the meeting, January 9, 1913.

There are cards acknowledging receipt, from persons in eastern Canada and the United States, dated April 10, 11, and 12, 1913, and one from the Imperial Bureau of Entomology, London, posted on April 14, 1913. Mr. W. E. Scott, Deputy Minister of Agriculture, Victoria, B. C. acknowledged 600 copies on February 27; these were to be given out at the Annual Meeting of the British Columbia Fruit Growers' Association. Western Specialty Co. gave the Society a receipt for $250.00, representing 1,000 copies of Proceedings No. 2, on April 18, 1913.

Accordingly the date of publication may perhaps be set as the last day of February (28), 1913.

Number 3. : With this number the title changes from "Proceedings of the British Columbia Entomological Society," to "Proceedings of the Entomological Society of British Columbia." Printed by the King's Printer. Both the cover and the title page state "July, 1913," but this means only that No. 3 contains the proceedings of the midsummer meeting, Vernon, B. C., July 18 and 19.

The proof for No. 3 was sent to Treherne for correction on November 3, 1913 (letter from W. J. Bonavia, Secretary to the Minister of Agriculture). There is a letter from W. E. Ward, dated December 2, 1913, in which he says, "I understand from the daily papers, that the British Columbia Entomological Society have issued their semi-annual report . . ." An old mailing list in our files is headed "List of Members, Regular and Complimentary, to whom copies of Bulletin No. 3 N. S. were sent in

November and December 1913," and there are letters of acknowledgment dated as follows :—

G. O. Day,	December 7	Arthur Gibson	December 24
H. F. Wilson,	December 13	R. T. Heselwood,	December 30

Thus late November, 1913, should be acceptable as a date of publication.

Number 4. This was originally to have been published as two separate numbers: the papers on economic entomology (pages 1-39) by the Department of Agriculture, the technical papers (pages 39-83) through the kindness of Mr. Kermode, by the Department of Education. The two sections were so financed, but the King's Printer was willing to print both under one cover.

In a letter to Treherne, dated October 14, 1914, the Secretary to the Minister of Agriculture said that he was forwarding a copy of Proceedings No. 4, just off the press, and that 800 copies would follow direct from the bindery. This shows that in Treherne's later remark (Proceedings No. 7, Part 2, page 24), October should be substituted for September. Dr. Gordon Hewitt in Ottawa had just received a copy of No. 4 on October 27, and on November 10 he acknowledges a number of copies to be distributed to the Ottawa staff.

Thus October 20, 1914, would seem to be a fair date to accept for the publication of No. 4.

Number 5. : This number was issued at the expense of the Society, to "set a standard in type of print thought desirable for scientific literature." The pages are numbered consecutively with those of No. 4, except that 79-83 (the index pages) of the latter were omitted from consideration, and hence the numbers are repeated in No. 5. Printed by the News-Advertiser, Vancouver.

The cover and title page are imprinted "January, 1915;" the proofs were on hand at the meeting of January 16, 1915, and were there examined by the members (letter of February 16, 1915, Treherne to G. O. Day): Treherne stated at the meeting that "We are getting out a little bulletin which will be Bulletin No. 5, and . . . will be published in about ten days . . ." In a letter to F. Kermode, dated February 17, 1915, Treherne mentions having heard complimentary remarks on No. 5, from persons who had received copies.

Accordingly, January 31, 1915 is probably acceptable as a date of publication for Proceedings No. 5.

Number 6. : This was published under the direction of the Provincial Museum of Natural History. It is paged consecutively with No. 5.

On February 16, 1915, Treherne wrote to Mr. G. O. Day, "I am submitting Bulletin No. 6 to the Department to print in Victoria . . ." On February 23, W. J. Bonavia wrote from Victoria, asking Treherne whether or not 1,200 copies would be sufficient. The letter of transmittal by F. Kermode (page following the title page) is dated March 5.

With no further data at hand, it is proposed to accept the date on the cover of No. 6, i.e., June, 1915.

Number 7. : I have no data on this number. It was issued through the King's Printer, and is independently paged. It contains some of the papers given at the Second Midsummer Meeting, Kelowna, August 20, 1914 (Part 1), and some from the Fourteenth Annual Meeting, Vancouver, January 16, 1915.

The cover and title page give the date "July, 1915".

Number 7A. : "Supplementary Report to the Proceedings of the British Columbia Entomological Society."

This report, printed by the Thos. R. Cusack Press of Victoria, cost the Society $60.00. It contains twenty pages numbered in Roman numerals; the cover is Page 1, and carries the date "April, 1916." The Cusack Press shipped the newly-printed Report to Mr. Williams Hugh, Hon. Secretary-Treasurer of the Society, on July 6, 1916, and in his account book there is the entry, "July 6th. Mailed 82 Reports."

Accordingly, the Supplementary Report is accepted as of July 6, 1916.

Number 8, Systematic Series. : This is marked "March 1916" in large type, on both the cover and title page; but at the bottom of each there is "1918" in small type. Independently paged.

We know that it was not published in 1916, for in Entomological News, **28** (10):469 (December, 1917) there is a quotation from a letter written by E. H. Blackmore, then President of our Society, to the News. At the foot of the page the editor (P. P. Calvert) says: "We heartily second the hope expressed by Mr. Blackmore in another place in his letter that the B. C. Entomological Society may, in spite of its difficulties, soon issue numbers 8 and 10 of its Bulletin." Dr. Philip P. Calvert tells me that Nos. 8 and 10 are stamped as having been received there on October 24, 1918; the two numbers were apparently sent to them in one shipment. The Library of the United States National Museum also received Nos. 8 and 10 together, on October 26, 1918.

There are entries by Wms. Hugh, in the Society's accounts for 1918, as follows:

"October 17. Cartage on Proceedings	$ .50
Postage Proceedings	2.00
October 18. Postage Proceedings	1.50"

These entries establish a mailing date, October 17, 1918, for Nos. 8 and 10.

Number 9, Economic Series. : This was published through the King's Printer, and the page numbers are a continuation from No. 7. The cover and title page are dated "August, 1916." The Library of the U. S. National Museum received their copy on December 14, 1916, so it is probable that the date of publication could be accepted as given on the cover.

Number 10, Systematic Series. : The cover and title page give "March 1917" in large type, and "1918" in small type at the bottom. Independently paged. See notes on No. 8; both these numbers were printed by The Colonist Printing and Publishing Co., Ltd., Victoria. The mailing date is established as October 17, 1918.

Number 11, Economic Series. : Published through the King's Printer; the page numbers are a continuation from No. 9. The cover and title page are dated "April . . . 1920." The following data are from letters in the Society's files: W. Downes (Hon. Sec.-Treas.) to E. H. Blackmore, April 9, 1920, "Bulletin No. 11 is temporarily held up as we are waiting for Mr. Baird's paper, which he had to send to Ottawa for approval." Mr. H. Ruhmann to W. Downes, September 2, 1920. "I return herewith the galley proof you sent for list of references . . ." (article 2, No. 11). W. Downes to R. C. Treherne, October 19, 1920. "Bulletin No. 11 is now ready, and I will send you a number of copies today." The U. S. National Museum received their copy on November 10, 1920.

Hence it appears that about October 20, 1920, would be an acceptable date for No. 11.

Number 12, Systematic Series. : Independently paged; printed by The Colonist Printing and Publishing Co., Ltd., Victoria. The cover and title page show "February, 1918" in large type, and "1919" in small type at the bottom.

The bill for printing was submitted to the Society on December 21, 1919, and reads as if the 500 copies of Proceedings No. 12 were handed over to the Secretary on December 17. There is a letter from W. Downes to Dr. Warnock on December 26, 1919, "The cost of issuing our last Bulletin, No. 12, was $196, an increase of $70 over the previous issue." A letter from W. Downes to W. H. Brittain, January 7, 1920, says in part, "The Proceedings of the B. C. Entomological Society No. 12 is now ready and we would be glad to send copies to all the members of the Nova Scotia Society, but we do not know their addresses." There is a similar letter, on the same date, to A. W. Baker of the Entomological Society of Ontario. The Library of the U. S. National Museum received their copy on January 21, 1920.

It is not likely that mailing to members of the eastern Societies was attended to until all members of the local Society had received their copies; hence December 31, 1919, should be a fairly accurate date for No. 12; there is an entry on that date in the Sec.-Treasurer's account book, showing that thirty-two copies of the Proceedings were mailed.

Number 13 and 15 (one volume), Economic Series. : Published through the King's Printer; the page numbers are a continuation from No. 11. The cover and title page give "June, 1921." The Library of the U. S. National Museum received their copy on December 27, 1921; No. 16 was received at the same time.

Number 14, Systematic Series. : Printed by The Colonist Printing and Publishing Co., Ltd., Victoria. Independently paged. The cover and title page show "March, 1919" in large type, and "1920" in small. There is a letter from W. Downes to R. C. Treherne, December 28, 1920, "The next bulletin No. 14, ought to be off the Press some time next week." Also one from G. O. Day to W. Downes, December 30, 1920, "I am returning herewith the galley proof of my paper on *Oporinia autumna*, together with the typewritten copy." On January 29, 1921, W. E. Whitehead acknowledged the receipt of twenty copies of No. 14, to be distributed to members of the Entomological Society of Nova Scotia. The

Library of the U. S. National Museum received their copy on February 2, 1921.

It is presumed from the above that early January, 1921, was the date of mailing of copies to local members of our Society.

Number 16, Systematic Series. : Printed by The Colonist Printing and Publishing Co., Ltd. Independently paged. The cover and title page show "February, 1920" in large type, and "1921" in small. The Library of the U. S. National Museum received their copy on December 27, 1921.

Number 17 and 19 (one volume), Economic Series. : Printed by Evans and Hastings, Vancouver; the pages are a continuation from No. 15. The cover and title page show "October, 1923." The bill for printing was submitted for payment on September 11, 1923. I have no other data.

Number 18, Systematic Series. : Printed by The Colonist Printing and Publishing Co., Ltd., Victoria. The cover and title page give "February, 1921." I have no further data. It is desirable to date this number accurately, since it contains H. M. Parshley's original descriptions of four new species of Hemiptera.

Number 20, Systematic Series. : Printed by Rose, Cowan and Latta, Ltd., Vancouver. The cover and title page state "September, 1922." According to entries in the Treasurer's account book, the Dominion Express Co. were paid on October 17 for delivering Proceedings No. 20, while $5.50 was paid out for postage stamps between October 25 and November 2. This indicates the second half of October, 1922, as a probable mailing date.

Number 21. : Printed by Evans and Hastings, Vancouver, and dated "1924" only. The following entries from the Treasurer's accounts for 1924, indicate early August as the mailing date, and also that some copies accompanied the August number (mailed Aug. 29) of the "Canadian Entomologist."

"July 31. Cheque, express on Proceedings ..... $ 2.35
Aug. 7. Cheque, stamps 10.00
Aug. 10. Cheque postage on Proceedings (Curran Bros) ..... 4.47"

But this does not agree with Glendenning's statement (Proceedings No. 22, p. 6) that it was published in October. This latter date is surely a mistake, for the printing bill was paid on August 14.

Number 22. : Printed by Evans and Hastings, and dated "1925." I have no further data.

Number 23. : On the cover, "1927." There is a letter of January 29, 1927, from the printers, Evans and Hastings, referring to No. 23, which must have been printed soon after that date. The Library of the U. S. National Museum received a copy on April 18, 1927, and the Division of Entomology at Ottawa got theirs on April 13.

Number 24. : On the cover and title page, "1927." There is a letter from the printers, Evans and Hastings, to R. Glendenning, dated January 11, 1928, giving a page estimate for No. 24. Also a letter to Messrs. Curran Bros., printers of the Canadian Entomologist, with reference to including copies of No. 24 with the February, 1928, number of that journal. Mr.

R. H. Ozburn advises me that the February, 1928, number of the Canadian Entomologist was mailed on March 5, 1928. The Library of the U. S. National Museum received a copy of our Proceedings No. 24 on February 17, 1928, while the Division of Entomology at Ottawa got theirs on February 13. Thus No. 24 was issued in February, 1928.

Number 25. : On the cover and title page, "1928." Printed by Murphy and Chapman, Vancouver. According to a letter from G. O. Day to R. Glendenning,, December 4, 1928, No. 25 was not yet in press. On January 8, 1929, Day returned a typed and corrected copy of his paper for No. 25, to Glendenning. I myself received No. 25 by mail, at Vancouver, on February 20, 1929 (record in personal diary), and the Ottawa library got theirs on March 19, 1929.

It is probable that early February, or perhaps January 31, 1929, could be accepted as the date of publication of this number.

Number 26. : On the cover and title page, "1929." There is a letter from Wrigley Printing Co., Ltd., to Glendenning, dated February 11, 1930, which refers to the figures for E. R. Buckell's article on earwigs, so No. 26 was not *printed* until soon after that date. The printers sent in their bill on February 20. I received a copy of the Proceedings by mail, at Vancouver, on February 27, the Division of Entomology got theirs on March 1, and the U. S. National Museum got theirs on March 5.

Therefore, the latter part of February, 1930, can be accepted as the date of publication of No. 26.

Number 27. : On the cover and title page, "1930." Printed by Murphy and Chapman, Ltd. On February 25, 1931, W. Downes wrote to Glendenning, asking to have a short paper put into the Proceedings, if it was not already in press. On March 2 he acknowledged Glendenning's answer, and says that since the number is in press, he will send his article to "The Pan-Pacific Entomologist." I did not receive No. 27 by mail, but copies were distributed at the Thirtieth Annual Meeting, in Vancouver, on March 21, 1931. The U. S. National Museum received their copy on April 1, 1931.

Thus March, 1931, can be accepted as the date of issue of No. 27.

Number 28. : On the cover and title page, "1931." Printed by Murphy and Chapman. According to a letter from Downes to Glendenning, dated March 30, 1931, Glendenning must have just asked for the manuscript of "Holly Insects," so that he could submit all papers for an estimate of the cost of printing. The Division of Entomology at Ottawa received a copy on November 30, 1931, and the U. S. National Museum got theirs on December 2.

Number 29. : On the cover and title page, "1932." Printed by Murphy and Chapman. The U. S. National Museum received a copy on August 19, 1932. G. O. Day, in a letter dated August 17, 1932, said, "I have duly received the copy of the 'Proceedings of the B. C. Entomological Society' [sic] you have so kindly sent me." My copy came by mail on August 11, 1932.

Number 30. : On the cover and title page, "March, 1933." Printed by The Quality Press, Victoria. According to a letter from W. Downes to

G. R. Hopping, October 23, 1933, copies of No. 30 had just been received from the printers. Except for a sample to Hopping, no copies had been distributed by October 28. On November 14, Downes sent 25 copies tc Hopping; the U. S. National Museum received theirs on November 27.

Thus it is probable that November 1, 1933, could be cited as the date of publication of No. 30.

Number 31. : On the cover and title page, "February — 1935." Many copies have been changed by pen, to read "February — 1934." Printed by The Quality Press. The date February, 1934, cannot be either a printing or a publication date, because on page 3 there is mention of the "Thirty-third Annual Meeting . . . held on Saturday, March 24, 1934, . . .", while on page 6 there is a footnote referring to an article in the "Canadian Entomologist" for August, 1934, (mailed September 2).

Galley proofs were ready on January 31, 1935. Following the suggestion in a letter from W. Downes (January 17, 1940), No. 31 should be considered as published on February 23, 1935, by distribution to members at the Thirty-fourth Annual Meeting. The U. S. National Museum received their copy on May 1, 1935.

Number 32. : On cover and title page, "Issued January, 1936." Printed by The Quality Press. On January 9, 1936, G. R. Hopping returned the galley proofs to W. Downes. On February 11, Hopping wrote to Downes as follows: "The copies of the Proceedings were received. I presume you are mailing to those on the list there and that these are given for odd requirements."

Copies were distributed at the annual meeting on February 28, 1936, and it may be best to accept that as the date of publication.

Number 33. : On the cover and title page, "Issued January, 1937." Printed by The Quality Press. On February 8, 1937, G. R. Hopping returned the page proofs to W. Downes. According to a letter from Downes (January 17, 1940) "No. 33, 1937, was distributed at the Annual Meeting on February 27, and the balance mailed early in March."

Thus February 27, 1937, is the date of publication for No. 33.

Number 34. : This is the first number printed by the Vernon News, Vernon, B. C. Succeeding numbers have also been done by that firm. On the cover and title page, "Issued February 16, 1938." This is actually a printing date; copies were not mailed or distributed then, but were first given out at the Thirty-seventh Annual Meeting at Vancouver, on February 26, 1938, which is thus the date of publication.

Number 35. : On the cover, "Issued February 25, 1939." This is an actual date of publication. Copies were received from the printers on February 24, and about thirty were distributed at the Thirty-eight Annual Meeting at Vancouver, February 25.

Number 36. : On the cover, "Issued February 24, 1940." This is an actual date of publication, as in the preceding case.

Number 37. : On the cover, "Issued February 22, 1941." This is an actual date of publication.

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